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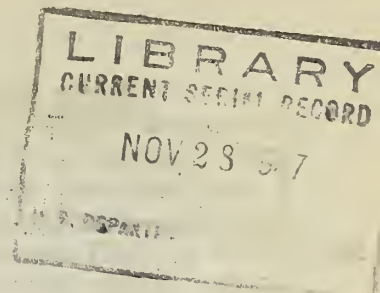
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UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for
SOIL CONSERVATION SERVICE RESEARCH**

SEPTEMBER 1947



EROSION CONTROL PRACTICES DIVISION

Potato Rotation Study - O. R. Neal, New Brunswick, New Jersey. - "The yields from the potato rotation plots were good but were unrewarding as far as differences in treatment effects are concerned. The total yield was about 390 bushels per acre on all treatments, with no significant differences between continuous cultivation, a 2-year rotation with wheat, and a 3-year rotation with wheat and clover.

"This result may be related to the fact that rainfall intensities appear to have been unusually low during most of the growing season. Analyses of the rainfall records have not yet been made but losses from the runoff plots were unusually low during the growing period. One of the principal benefits of crop rotation treatment is the improvement of physical properties of the soil which brings about an increase in the rate of water absorption during storm periods. If, however, all the rain falls at a sufficiently low rate the water may enter soils of both good and relatively poor physical properties in equal amounts. Under such conditions the effect of treatment is minimized.

"Difficulty is always encountered in balancing fertilizer applications between treatments in a study of this type. The potatoes receive 1800 to 2000 pounds of 5-10-10 or 4-12-8. The wheat receives 250 pounds of the same material, while the clover is unfertilized. Thus the continuously cultivated areas are heavily fertilized each year, areas in a 2-year rotation are heavily fertilized once in two years, while areas under the 3-year system receive the heavy fertilization only once in three years. There is undoubtedly some residual effect of the high fertilization. Thus the effect of the presumed deterioration of physical properties of the continuously cultivated soil tends to be counter-balanced by what amounts to a higher fertilization of these plants. We know of no completely satisfactory solution to this difficulty in conducting crop rotation studies."

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**All Research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

Three Days of Wind Erosion - Hugh C. McKay, St. Anthony, Idaho.-

"During the month of September three days of wind occurred that caused serious wind erosion in this area. In the dry farm areas visibility was less than a half mile all three days. Only a timely rain on the fourth day prevented much more serious damage. In the Power County area it was estimated that 20,000 acres of fall seeded wheat was blown out and required reseeding. In many of the fields all of the soil down to the plow sole was removed, making it necessary to replot. One farmer in Power County became lost while trying to find his way from his tractor in the field to his house. The worst damage occurred on the lands that are being newly plowed out of sagebrush for wheat production under about an 8 inch annual rainfall."

Improved Pasture Systems Versus Cash Grain Systems - Dwight D. Smith,

Columbia, Missouri.-"Improved pasture systems under study at McCredie are in general superior to cash grain systems of farming claypan soil from the standpoints of soil loss, fertility level, and net return per acre. Only exceptions were wheat-Korean lespedeza harvested for grain and hay, which was slightly higher in net return, and bluegrass pastures, which were the lowest in net return of any systems investigated. An abstract from tables in a paper entitled 'Erosion and Production Under Missouri Grazing Systems', by Whitt and Smith, gives specific data.

Soil loss, organic matter change, and return from pastures and selected grain systems on the Missouri Soil Conservation Experiment Farm. Plots 10-1/2 feet wide, 90 feet long, 3 percent slope, Putnam silt loam.

Cropping System ^{1/}	Soil Loss per Acre/Year (Tons)	Organic Matter Change 1940-46 (Lbs/acre)	Return/acre/year		
			Gross ^{2/}	Net ^{2/}	Net ^{3/}
Timothy & Lespedeza	0.40	45,000	\$20.00	\$13.62	\$19.08
Oats (hay) & Lespedeza	2.59	0	23.30	12.08	15.21
Wheat & Lespedeza	2.01	0	22.89	11.81	17.66
Barley & Soybeans (hay)	3.93	-1,600	27.12	10.66	13.14
Timothy, Sw clover & Lesp.	0.30	44,400	21.14	12.54	17.83
Bluegrass - renovated	4/	5/	14.47	4.12	6.29
Bluegrass - check	4/	5/	10.09	8.25	10.90
Bluegrass - contour furrowed	4/	5/	9.03	7.07	9.38
Oats & Lesp. (both hay)	1.78	0	22.75	9.55	10.33
Wheat(grain) & Lesp. (hay)	1.31	0	26.75	13.74	17.73
Corn-corn-oats-wheat (Sweet clover under)	4.91	5/	20.82	9.93	13.16
Corn-wheat-meadow	1.64	5/	19.35	9.34	11.71
Corn-oats	7.50	-3,200	16.26	9.96	12.47

^{1/} The first 8 systems are grazed except as noted, remainder are for grain and/or hay.

^{2/} Based on average prices in Missouri 1932-46 inclusive.

^{3/} Based on average prices in Missouri 1940-46 inclusive.

^{4/} Negligible -not measured.

^{5/} Determinations not completed.

First Year Corn More Drouth Resistant than Second Year Corn - G. M. Browning, Ames, Iowa.-"There was marked differences in growth of first and second year corn in the rotation studies. Second year corn was light green in color and showed marked symptoms of nitrogen deficiency. The common opinion of farmers throughout the state has been that the poor growth of corn is associated with lack of moisture. The rotation plots at the Clarinda farm as well as other locations indicate that while there has been damage from drought one of the most important factors is the past management. First year corn following one or two years of a good legume grass meadow has shown less signs of moisture deficiency than the second year corn. This would indicate that favorable air and water relationship and nutrient availability under first year corn was more of a factor than damage from drought."

Pitting with Eccentric Disc Makes Good Seedbed for Lovegrass - Joel E. Fletcher, Tucson, Arizona.-"Love grass planted over a pitted area showed marked growth and was even setting seed, while the grass adjacent to the pits became drought losses. It would appear from these tests that the eccentric disc is an exceptionally successful and economical method for improving infiltration during seeding operations. The cost of the pitting and seeding exclusive of the cost of seed itself is approximately .50 per acre. By way of comparison, the contract price for airplane seeding was \$1.75 per acre exclusive of seed, while the number of plants obtained per acre was below 100 average. Seedlings surviving under eccentric disc treatment were in excess of 40,000 per acre."

Productiveness of Seeded Dryland Pastures Declines with Age - O. K. Barnes, Laramie, Wyoming.-"The grazing results from the seeded pastures are shown in the table on the following page, for all years including 1947.

"The 1947 results show a marked decline in productivity of most pastures. This was probably true in 1946, except that the extreme shortage of moisture in the spring of 1946 made it impossible to identify the cause of decline.

"The one exception to this general decline was the grass-legume mixture. In 1947 this pasture supported more grazing than any previous year and more than any other pasture.

Soil Cover Rating - H. O. Hill, Temple, Texas.-"The thesis work of Mr. L. Sreenivas on 'Some Relationships of Vegetation and Soil Detachment in the Erosion Process', has been condensed into a paper for publication at the meetings of the Soil Science Society of America by Dr. J. R. Johnston. In this work a soil cover rating was developed on the amount of soil splashed by natural rainfall from soil with different kinds of cover. It was found that a good grass cover such as buffalo grass was more effective and gave a higher soil cover rating than did a good cover of sweet clover. Soil cover rating for buffalo grass varied from 96.8 to 100 with an average for 11 rains of 98.5, whereas, the rating for sweet clover varied from 85.2 to 100 with an average for the same 11 rains of 93.8. The soil cover rating is actually a measure of the effectiveness of soil cover between the value of zero for no cover and 100 for no soil loss and is derived by the following formula.

$$\text{"Soil cover rating"} = \frac{\left(\frac{\text{Weight of soil splashed from bare land}}{\text{Weight of soil splashed from bare land}} \right) - \left(\frac{\text{Weight of soil splashed under cover}}{\text{Weight of soil splashed from bare land}} \right)}{1} \times 100$$

Seeded Dryland Pastures - Archer Field Station
1942-1947

	1942		1943		1944		1945		1946		1947		Average	
	Per Acre	Lamb	Per Acre	Lamb	Per Acre	Lamb	Per Acre	Lamb	Per Acre	Lamb	Per Acre	Lamb	Per Acre	Lamb
	Days	Gain	Days	Gain	Days	Gain	Days	Gain	Days	Gain	Days	Gain	Days	Gain
	lbs.		lbs.		lbs.		lbs.		lbs.		lbs.			
Crested wheat	228	143	196	125	173	108	173	90	58	35	160	97	165	100
Standard	228	149	196	123	173	107	173	90	56	22	142	88	161	97
Crested wheat	195	124	152	87	158	94	169	76	58	33	139	82	145	83
Grass	172	134	157	76	169	No	211	125	127	71	233	121	178	105
Mixture														
Grass-legume														
min in 37" rows														
Crested wheat	127	56	141	69	67	"	173	89	119	46	147	77	129	67
in 37" rows	200	102	127	65	114	53	139	59	62	31	87	47	122	60
Russian	178	105	154	77	128	73	139	71	49	27	132	72	130	71
Wild Rye	187	101	145	62	148	37	135	17	54	18	92	13	127	41
Western														
heat														
Blue Grama and														
Buffalo														
Native	71	26	69	42	59	29	61	30	47	20	70	30	63	30
Range														

Note: All seedings except as noted are in 7 inch drill rows.

Residue Management Studies on Wheat Land - C. J. Whitfield, Amarillo, Texas.--"Wheat yields of the 1947 crop from the stubble mulch plots were as follows:

Cropping Practice	Implement	Bu. Wheat Per Acre
Continuous wheat	Oneway	28.4
	Sweeps	34.4
Continuous wheat - stubble burned	Oneway	28.7
Wheat - early fallow	Oneway	33.1
	Sweeps	36.8
Wheat - delayed fallow	Sweeps	36.3

"In the implement column, the term "oneway" represents tillage with the oneway disk between harvest of the preceding crop and seeding of the next one. 'Sweeps' refers to sub tillage with the sweep machine developed at the station, or with the Noble cultivator. Early fallow involves tillage immediately after harvest and as needed until the next seeding. With delayed fallow, tillage is deferred after harvest until the following spring.

"The yield data show a 6-bushel advantage for sweeps over oneway in continuous wheat. This increase follows the trend of results in the past two years. The 1947 crop was a large one for this area, the long-time average being about 12 bushels. In years of less favorable moisture (and other) conditions, the percentage increase has been higher. An interesting factor regarding yields for 1947 is that very little straw was produced in the preceding year and practically no residues were on the surface at seeding time. It then would appear that, beside the mulch effect of residues, other factors related to the tillage practices are responsible for at least part of the yield increase obtained from sub tillage. Less pulverization of the surface soil and, hence, a greater infiltration of rainfall may be an important factor."

Yield of wheat as Affected by the Method of Tillage Used in Seedbed Preparation Under Continuous Wheat, Edgeley, 1947.- C. L. Englehorn, Fargo, North Dakota.-

Tillage	Yield of wheat, bushels an acre			
	1	2	3	Average
Moldboard plow	19.7	16.1	16.3	17.4
Burn residue, no tillage	11.7	14.5	14.7	13.6
2-Ton straw, stubble mulch tillage	21.5	17.0	15.2	17.9
Stubble mulch tillage	14.7	12.5	10.8	12.7
Field cultivator	12.2	11.5	12.2	12.0
Disk	12.3	15.5	13.2	13.7

"At Edgeley, stubble mulch tillage of binder stubble after the addition of straw at the rate of 2 tons an acre, produced a yield equal to that of plowed stubble. Stubble mulch tillage of stubble land without added straw produced a yield less than plowed stubble but equal to stubble tilled by the field cultivator or the disk. Where plant residues were removed by burning and wheat seeded without any tillage the yield was less only than that of plowing or stubble mulch tillage without added straw.

"At Langdon similar results were obtained under continuous cropping. The highest yield, 24.7 bushels, was obtained from fall plowing, followed by 22.6 bushels from spring plowing, 15.7 from fall tillage with the oneway disk, 15.6 bushels from fall stubble mulch tillage and 14.0 bushels from fall tillage with the field cultivator.

Yield of wheat as affected by the method of tillage used in seedbed preparation under continuous wheat. Langdon, 1947.

Tillage	Yield of wheat, bushels an acre			
	1	2	3	Average
Moldboard plow, fall	24.3	24.7	25.0	24.7
Moldboard plow, spring	22.0	21.7	24.0	22.6
Oneway disk, fall	15.7	15.0	16.3	15.7
Field cultivator, fall	14.7	14.0	13.3	14.0
Stubble mulch, fall	17.7	13.0	16.0	15.6

1947 Yields of Spring Wheat on Different Methods of Fallow at Froid, Montana - Torlief S. Aasheim, Bozeman, Montana.-

Method of Fallow	Residue Treatment	Bu. per Acre
Noble cultivator (first cultivation in fall)	T	28.7
Noble cultivator (first cultivation in spring)	T	27.1
Noble cultivator (first cultivation in spring)	B	25.9
Oneway	T	24.0
Mold Bd. plow and duckfoot with waffle	B	26.8
Mold Bd. plow and duckfoot with waffle	T	27.3
Mold Bd. Plow and rod weeder	T	27.0
Mold Bd. plow and basin lister	T	26.0
Corn ground (disced)		16.4
Corn ground (plowed)		16.5
Idle land (spring plowed)		18.0
Mowed Idle land (spring plowed)		17.0

B - stubble burned

T - stubble not burned

"It is of interest to note that the average of all sub-tilled plots at Froid was 27.2 bushels and the average of all mold board plowed plots was 26.8 bushels. It is now eight years since any of the subtilled plots have been plowed, this indicates that on this particular soil type mold board plowing is not necessary from a standpoint if increasing wheat yields is an alternate crop and fallow system.

"Plowed corn ground and disced corn ground yielded almost identically the same, yielding 10.1 bushels less per acre than the average of all fallow, and 1 bushel less than all idle land. The average yield of plots in crop the second year after fallow (not in table) was 19.1 bushels which is 2.6 bushels higher than the yield on corn ground.

1947 yields of spring wheat on different methods of fallow at Havre, Montana.

Method of Fallow	Bushels per Acre	
	B	T
Sweep Sub Surface Tiller	14.4	14.1
Noble Sub Surface Tiller	13.8	15.8
Mold Bd. plow and duckfoot	16.1	14.6
Mold Bd. plow and rod weeder	15.4	15.9
Oneway	14.8	14.0
Mold boardless plow	14.1	14.3
Average	14.8	14.8

B - Stubble burned; T - Stubble not burned

"From this table it is readily seen that there are very small differences in yield among the various treatments. The average yield on all burned plots was the same as on all unburned plots. All mold board plowed plots averaged 15.5 bushels; all sub surface tilled plots averaged 14.5 bushels, oneway plots averaged 14.4 bushels and plots cultivated with a moldboardless plow averaged 14.2 bushels."

Cropping Treatments and Tillage Methods in Relation to Wheat Yields, 1947 - F. L. Duley, Lincoln, Nebraska.-

Plot	Cropping Treatment	Yield of grain, Bushels per acre		Yield of Straw, Tons per acre	
		Plowed	Stubble mulch	Plowed	Stubble mulch
<u>Lincoln, Nebraska</u>					
23-IV	Sweetclover, oats, wheat	28.2	28.7	3.16	3.13
B-1	Brome sod, corn, oats, wheat	37.1	33.9	2.41	2.11
26-IE	Sweetclover 2 years, wheat	28.5	32.2	3.03	2.73
Rotation	Corn, oats, wheat	40.4	32.0	2.31	1.67
23-III	Wheat, oats, wheat	39.9	35.2	2.71	2.02
<u>Hastings, Nebraska</u>					
I-I-E	Sweetclover, oats, wheat	40.5	36.8	2.68	2.56
2-I-W	Sweetclover 2 years, wheat	36.1	33.5	2.73	2.04
F	Fallow	25.5	24.6	1.80	1.53
	After oats - not fallowed	15.4	--	0.83	--

Effect of Method of Seedbed Preparation on Wheat Yields at Marcellus. - G. R. Free, Marcellus, New York. - "The plots of this experiment were in wheat in 1947. The crop in 1946 was oats, and in 1945 corn. Three methods of seedbed preparation -- plowing, subsurface plowing, and disking -- are being compared under three different rates or methods of fertilization, and with and without a rye grass cover crop in corn. The effect of fertilization on wheat yields was slight and not significant. The effect of method of tillage was marked and highly significant. Another factor affecting results was whether rye grass had been used as a cover crop in corn. In the case of the plowed plots, the cover crop had a slightly beneficial effect on yields. In the case of the subsurface-plowed and disked plots, the cover crop lowered yields because of competition resulting from an incomplete kill of the rye grass when a seedbed was prepared for oats by these methods.

Method of seedbed preparation	Wheat yield per acre with	
	Cover crop for corn	No cover crop for corn
	Bushels	Bushels
Turn plowing	30.7	29.5
Sub-surface plowing	20.7	24.9
Disking	18.2	19.4

Soil Moisture Under Orchard Cover -- Treated and Untreated with Herbicide - At Geneva. - E. A. Carleton, Geneva, New York. - "The data in the following table show the difference in soil moisture under cover crops in a sour-cherry orchard where a portion of the cover in each row was sprayed with a weed killer on June 13 to arrest growth. The moisture data are averages of determinations made June 26 and June 30.

Cover crop	Soil depth Inches	Soil moisture under		Difference Per cent
		Untreated Percent	Treated Percent	
Field brome	0-6	11.0	14.8	3.8
	6-12	10.9	15.8	4.9
Perennial rye grass	0-6	12.0	14.1	2.1
	6-12	13.5	15.3	1.8
Brage orchard	0-6	12.7	14.1	1.4
	6-12	12.3	15.4	3.1
Creeping red fescue	0-6	12.9	15.0	2.1
	6-12	13.6	16.5	2.9
Tall fescue	0-6	13.4	17.4	4.0
	6-12	12.5	17.3	4.8

Patience is Required - G. R. Free, Marcellus, New York. - "In August of 1943, some birdsfoot trefoil was seeded at Marcellus. The resulting stand and growth appeared very poor, but the area was not disturbed. The stand has gradually thickened, and this year about 15 pounds of seed was harvested."

Defoliation of cherry Trees in Relation to Ground Cover and Nitrogen Application at Geneva - E. A. Carleton, Geneva, New York.—"There are indications that the percentage defoliation or loss of leaves in a cherry orchard at Geneva, as observed on September 4, was associated with the amount of soil moisture and also of nitrogen. Soil moisture in the orchard under eight cover crops and under cultivated treatment was followed during the spring and summer with the last determination being made on June 26. At that time, creeping red fescue, tall fescue, and Kentucky bluegrass had the least moisture in the 0 to 12-inch depth. Average defoliation for the trees with these cover crops varied from 71 to 87 per cent. Defoliation for the cultivated treatment and other covers, which included field brome, perennial rye grass, brage orchard, ladino, and birdsfoot trefoil, ranged from 23 to 53 per cent, with ladino giving the lowest values. Soil moisture under these treatments on June 26 was slightly greater than that under the three covers mentioned above.

"Some of the trees under each cover received an application of 2-1/2 pounds ammonium sulphate in 1947, and some an application of 7 pounds. The higher amount of nitrogen fertilizer gave lower average percentage of defoliation in 14 out of 18 comparisons. This, together with the fact that the legume cover, ladino clover, gave the lowest percentage defoliation of the various cover crops, emphasizes the importance of nitrogen.

"These data are for one season only, but the relationships that seem to be indicated are considered worthy of further study."

Do Earthworms Explain the Beneficial Effects of Liming on Infiltration? - Henry Hopp, Beltsville, Maryland.—"On a recent trip to the Ohio Agricultural Experiment Station at Wooster, Clarence Slater and I, at the suggestion of Dr. R. E. Yoder, examined the earthworm situation in liming plots. The plots had been seeded to timothy and alfalfa, and were being maintained at several pH levels. Our observations included the number and weight of earthworms, the number of earthworm holes at a 4-inch depth, and the infiltration rate, with the following results:

Observation	pH	pH
	5.5	6.5
No earthworms/square foot	4.3	13.5
Wt. earthworms, g/sq. ft.	.96	4.98
No worm holes/square foot	22	58
Infiltration, cc/min.	10	78

"The larger number of worm holes at the higher pH level, as a result of the larger number of worms, was the obvious explanation for the more rapid infiltration rate."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - I. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-"Practically all rainfall of 3.02 inches for the month went into the ground. Only the straight-row corn watershed yielded runoff. There was no water percolating from the bottom of the 8-foot lysimeters.

"Considerable attention has been given to permeability of soils on the corn watersheds and plots. On the plowed areas the soil surface had become sealed from the action of rain drops. Particularly noticeable was the collection of fine soil particles in the furrows between corn rows. In contrast, on the mulch corn areas, there was apparently less soil splash, less soil torn loose by rain drops, and consequently, less concentration of fine soil particles in the furrows. Samples were taken in the 0- to 3-inch depths on both areas and percolation rates determined. Results are given below:

Percolation rates for field samples (inches per hour)

	Plowed area	Mulch area
Individual samples	1.64 .50 .67 1.46	3.22 1.55 *6.87 4.13
Average	1.07	2.97

*Erratic value. Not used in determining average.

"Plant residue content of these samples given below is possibly the major factor in the difference of soil splash and the subsequent difference in permeability on the plowed and mulch corn areas.

Plant Residue (lbs. per acre inch)

	Plowed area	Mulch area
	93 44 12 12	322 333 138 122
Average	40	229

Hydrologic Studies- W. D. Ellison, Beltsville, Md.-A paper entitled "Soil Erosion Studies - Part VI (Soil Detachment by Surface Flow)" was published in "Agricultural Engineering," in September, pp. 402-405, 1948.

Hydrologic Studies - R. W. Baird, Blacklands Experimental Watershed, Waco, Texas.-"Rainfall for the month totaled 1.44 inches at Station 69. This was sufficient to make fall plowing possible, but much more rain is needed. The total from January 1 through September 30 has been only 19.77 inches while the mean is 26.48 inches. There have been only 3.96 inches from June 1 through September 30 compared to the mean of 10.43 inches.

"Considerable work has been done on the analysis of runoff records with special emphasis placed on the 20-acre areas. Records are available for only 11 storms with runoff rates greater than 0.5 inch per hour at Station W-10 since conservation practices have been established on the comparable area Y-10. The maximum runoff rates from any of these storms was 3.18 inches per hour at Station W-10 and 3.04 inches per hour at Station Y-10 on May 12, 1946. More records are needed but it is hoped that some tentative conclusions can be drawn from the records now available. During the preliminary period before either area W-10 and Y-10 had conservation practices established, there were 28 storms causing runoff rates at W-10 in excess of 0.5 inch per hour and the maximum runoff rates were 5.01 inches per hour at Station W-10 and 3.47 inches per hour at Station Y-10 on June 10, 1941."

Hydrologic Studies - John A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebr.-"Only 0.39 inch of rain was measured at the meteorological station during September, which is the third consecutive month below normal and a deficiency of over 5.0 inches have accumulated during the period. The dry weather has delayed fall plowing and for the past 2 months it has been too dry to plow, hence a suitable seed bed has not been prepared for wheat. In a number of cases, on land which was plowed immediately after harvest of the small grains, wheat seeding was done prior to September 17, which is the earliest date recommended, because of the Hessian Fly, hence these fields are liable to considerable damage.

"Corn picking has started on the low yielding fields and this has been an excellent year to observe the value of good farming as compared to poor farming practices. Fields which have not been properly managed have been almost a failure while well-managed fields will produce an average yield in spite of the hot dry weather. The conservation of moisture from the heavy June rains was a vital factor in crop yields."

Hydrologic Studies - R. B. Hickok, LaFayette, Ind.-"Rainfall was considerably above the September 'normal.' Storms of about 1.4 and 1.6 inches on the 15th and 21st, respectively, produced substantial runoff losses from watersheds in corn under 'prevailing treatment.' The runoff from watersheds in 'prevailing' treated soybeans (rowed) was much less than from those in 'prevailing' treated corn, and there was no significant runoff from those in either corn or beans under the conservation treatment.

"Chemical analysis of runoff samples is now being handled by a recently organized analytical section of the Agronomy Department of the Station. They report progress on analyses of the samples collected since early summer; but the composition data have not yet been made available for integration with the volumetric runoff measurements, for determination of the total soil and fertility losses. It is expected that this work may soon be brought up to date.

"Soybeans have shown a very outstanding difference between those on the conservation- and 'prevailing' treated watersheds. The vines have been much more vigorous, taller, and more branched, with every indication of substantially higher yields to come from those on the conservation-treated watersheds. The difference in vigor has been noticeable since the beans first came up and resulted in almost complete ground coverage between the rows (40 in. spacing) since mid-season, while rows have remained relatively open on the 'prevailing' treated watersheds. There was no fertilization of the bean crop in either treatment. The difference in vigor of the plants and yield prospects, while contributed to by some reduction in runoff, has likely been due mainly to residual effects of differences in the fertilization of preceding crops, since 1943.

"While stands of corn continued to be 'spotty,' due largely to deficiencies in equipment for seeding and fertilizer placement under mulches, we appear to have the best prospects for yields on the plots this year since the beginning of the experiments, both at LaFayette and for the 'hummocky' land experiment in Noble County. After some preliminary tests at LaFayette last season, a subsoil-plowing treatment was added to both experiments this year. While this treatment produced the highest yields at LaFayette last year and looks outstanding here again, it appears to be the most unsatisfactory treatment in the Noble County Experiment. There, the deep plowed plots have been obvious for poor vigor and growth throughout the season, appearing to show aggravated deficiency of potash as a result of mixing of subsoil into the plow layer."

Runoff Studies - N. E. Minshall, Madison, Wisc.-"In September, I examined the box-type erosion control spillway in Richland County. This type of spillway in Richland County apparently has given considerable difficulty, most of which is due to faulty design.

"I received an inquiry from Crawford, Murphy, and Tilley, Consulting Engineers of Springfield, Ill., regarding rates of runoff to be expected from a 4-square mile drainage area in Stevenson County, Northwestern Illinois. No detailed information was furnished me as to the shape, slopes, soils, and cropping practices of the area involved. The topography, soils, and general farming in this area are believed to be similar to those on the Fennimore watershed, and because of this they were furnished information based on the analysis of the Fennimore data and runoff data on other small watersheds in that vicinity."

Hydraulic Studies - F. W. Blaisdell, St. Anthony Falls Hydraulic Laboratory, Minneapolis, Minn.-"Mr. Donnelly spent the entire month testing the box-inlet drop spillway. Two tests were made to complete the series covering the effect of narrow approach channel on the rating curve when the length of the box inlet is two times its width. The results of these tests are now being analyzed. The box inlet was then revised to give a length equal to the width; that is, square in plan. The depth is equal to the width so the box inlet resembles a cube. A rating curve was obtained for this structure, and submergence rating curves were obtained for seven different discharges on one outlet and for three discharges on another. Submergence tests are continuing on

additional outlets in order to cover the anticipated range of field conditions. Miss Gosselin computed rating equations for four tests during the month using the method of least squares.

"Mr. Blaisdell ran four tests on transitions for supercritical velocities. Although the study is still incomplete, a point has been reached where it can be temporarily discontinued in favor of the pipe drop-inlet spillway. Preference is being given to the latter at the request of the Region 3 Engineering Division. In reply to an inquiry, Mr. Freyburger has written, 'Of 140 structure plans which have passed through this division for checking, review, or design, during the first 6 months of this year, 69 were for pipe drop-inlet spillways.'"

Supplemental Irrigation - James Turnbull, Lake Alfred, Fla. "The hurricane which swept across southern Florida on September 17 and 18 caused little damage in this area. Some grapefruit were blown down on the experimental plots but the loss was not great. It has been estimated that between 3 and 5 per cent of the grapefruit crop was lost. There was no damage to the oranges on the experimental plots. Heavy rains accompanied the storm and 7 inches were recorded in a 24-hour period on the irrigation plots.

"The rainfall was reflected by an immediate rise in the elevation of the water table and by a reversal in the normal slope of the water table. The slope of the water table had returned to normal by October 8.

"The following table shows the elevation on September 15, before the rains started, on September 19, after 7.16 inches of rain, and on October 8, after the water table had returned to its normal slope.

Well Number	Elevation of water table		
	Sept. 15	Sept. 19	Oct. 8
1	129.29	129.50	133.10
2	129.27	129.67	133.06
3	129.29	129.69	132.77
4	-	-	132.35
5	129.21	130.11	132.08
6	129.12	131.95	131.74
Lake	128.91	129.50	129.90

Supplemental Irrigation - J. R. Carreker, Athens, Ga. "Rainfall totaled 1.49 inches in September, with a deficit of 1.76 inches from the monthly average of 3.25 inches. The rainfall pattern preceding and during the month was:

August 22	0.95 inch
Sept. 10	.92 "
" 16	.04 "
" 19	.01 "
" 25	.52 "

"Supplemental irrigation applications were made as follows:

	Okra	Pasture	Supplemental grazing
	inches	inches	inches
Sept. 1	1		
2-3		2	
9	1		
22-23		2	
20-30			1

"A 5-acre temporary pasture was planted to oats, ryegrass, and crimson clover for supplemental grazing September 15. Three acres of the area were also seeded to alta fescue grass.

Runoff Studies - T. W. Edminster, Blacksburg, Va.-"Following a visit to the Washington Office, the Ridges and Valleys peak rate manuscript was given its final revision and submitted to the Director of the Experiment Station for clearance. Some time was spent both in the Washington Office and during other periods of the month in the preliminary analysis of available data upon which to prepare a bulletin covering expected yields of runoff for the Ridges and Valleys. Following discussion of procedures of analysis with Mr. Potter, steps were outlined for the analysis of these data in the near future.

IRRIGATION DIVISION

Water Application - I. D. Wood, Denver, Colo.-"At the request of the Extension Director of the Texas Agricultural Extension Service, I attended the conference held at College Station on the above dates. On September 1 an important conference was called to discuss a future teaching, research, and extension program related to Texas irrigation. Attention was called to the fact that Texas now has approximately 2,000,000 acres of irrigated land located from the Panhandle to the Rio Grande River.

"I had an opportunity to discuss the research possibilities through the Soil Conservation Service and to outline an extension program. Other talks were given by R. D. Lewis, director of the Experiment Station, Ide P. Trotter, director of the Extension Service, S. E. Jones, vice-director of the Experiment Station, and vice-president of the institution, D. W. Williams.

"A great deal of interest was evidenced in the possibilities of research, extension and teaching programs. Committees were appointed and early action is anticipated.

"Another important conference was held with the teaching staff of the Agricultural Engineering Department on September 2. All present courses were reviewed and recommendations made with regard to both teaching and laboratory work in connection with irrigation. The faculty were furnished with a large number of irrigation references and sources of other information. Regular Extension Service conferences were attended when the opportunity presented itself.

"At the request of Extension Director George Gilbertson and Dean A. M. Eberle of the South Dakota Agricultural College, I spent 3 days at Hot Springs, S. Dak., in conference with regard to the 7-11 Ranch, a tract of 35,000 acres which has recently been presented to the South Dakota Agricultural College by Mr. F. O. Butler of Hot Springs."

Consumptive Use and Moisture Requirements - J. S. James, Billings, Mont.-"Work on the research project on consumptive use and moisture requirements consisted largely of analysis of climatological data for 20 areas for which consumptive use was reported by Robert L. Lowry, Jr., and Arthur F. Johnson. (Proceedings of American Society of Civil Engineers, April, 1941.) Particular attention was given to analysis of conditions on the 11 non-irrigated drainage basins.

"For most of these non-irrigated areas, Lowry and Johnson estimated consumptive use as the difference between precipitation and runoff. Corrections were made for some 'dry' years when rainfall was obviously insufficient to maintain full vegetative growth. For these areas, analysis is being made of the actual relationship between precipitation and 'potential consumptive use' or moisture demand to meet full requirements. The latter factor is estimated on the basis of approximate distribution of use, or demand, in proportion to average monthly temperatures.

"Such an analysis indicates considerable moisture deficiencies for all of the areas in most years,--much greater deficiencies than these estimated, or assumed, by Lowry and Johnson. These deficiencies are due to inadequate distribution, or timing of precipitation and are apparent in nearly all years even though considerable excess of annual precipitation occurred in all years reported.

"Another indication is that the value of such an index will be as great for estimating approximate excesses of water to be disposed of in humid areas as for estimating deficiencies to be supplied by irrigation, or otherwise adjusted to, in all areas. From preliminary studies it seems evident that at least occasional moisture deficiency imposes some limitation on agricultural practice in all parts of the country.

Irrigation in Utah -- G. D. Clyde, Logan, Utah.--Barrett reports,

"Revision of the SCS snowmobile, together with a special trailer for it, has been completed. Re-design and specifications of a final model of snowmobile that will best meet the requirements of over-all transportation for snow surveys is under way."

Fuhrman reports--"The Utah Agricultural Experiment Station is planning the revision of the irrigation distribution systems on two of their experimental farms. As Collaborator I am assisting in planning this revision. The proposed irrigation system should offer excellent opportunity for research in the application of water - a problem of vital concern to Utah farmers."

Lining of Irrigation Canals and Ditches.--Lauritzen reports--"Routine observations on experimental linings on channels A and B were continued. The gravel mat in channel C was replaced with a mat of fine gravel and sand.

"Tentative agreement was reached with the Richmond Irrigation Company for installation of experimental linings in their canal. This will include concrete, both with and without reinforcing; Gunite, 1-inch and 2-inch with and without reinforcing; Bentonite sand mixture protected with gravel and with rock riprap on loosely placed concrete slabs."

Maughan reports--"In September field work was confined to two districts in Davis County. Drainage District No. 1, organized in 1920 comprises a low lying area between the irrigated lands and Great Salt Lake. The soils are heavy clay texture and alkali is prevalent. A tile system was installed in 1920-21 but since that time very little maintenance work has been done. It is reported that the drains functioned well at first but gradually the lines have clogged until at present the discharge from outlets is much less than formerly.

"This system, like a number of others in nearby counties, was installed largely as a promotion project on virgin land of untried quality, and like all other such projects it failed. There were few farmers on the land, the drainage lines were not adequately maintained and the district soon defaulted on its debts. Little interest and no principal were ever paid on the \$60,000 bond issue. The district was never given a good trial and the few remaining farmers on the land are divided in opinion as to the merits of the enterprise as undertaken. All are agreed that the drainage system has been poorly handled.

"The Farmington Drainage District is a small area of 300-400 acres of good farming land just below Farmington. A tile system was installed about 1908 through informal cooperation of the farmers. In the beginning the system occupied perhaps twice the area of the present district, including 300-400 acres of low lying natural meadows. The difference of interest of farmers owning the high farm lands and those on the lower meadow areas caused continual controversy in the handling of the drains.

"In 1930 the Farmington area was organized into a drainage district and new outlets were installed to completely separate the drainage of higher lands from the lower areas. The systematizing of maintenance resulting from formal organization and the unity of interest of farmers within the reduced area have largely solved the problems of drainage. The system is now adequately functioning at a nominal cost."

Karl Harris reports-"The effect of the following soil amendments was tried on a dispersed soil, FeSO_4 , FeSO_3 , SO_2 , $\text{Fe}_2(\text{SO}_4)_3$, and H_2SO_4 . No one of these amendments seemed to have any advantage over the others. They all increased the infiltration rate from 0.12 to 0.32 inch per hour. The rate even with the amendments was still too slow. Other means should be looked for."

Rice Irrigation and Silt Studies -Dean W. Bloodgood, Austin, Tex.-"During the tropical storm (hurricane) that occurred on August 24, 6.00 inches of precipitation were recorded at the Wood farm. Since this storm Mr. Wood has not irrigated his rice farm and states he will not irrigate any more this season as most of the rice crop is about made. Up to August 25, when the pumping plant was closed down, a total of 1.92 acre-feet per acre (based on 230 acres) had been pumped and applied during an irrigation season of 100 days from May 17 to August 24. The pumping plant was operated approximately 1,740 hours and the pump capacity averaged about 1,000 g. p. m. The total meter measurement is 104,417,500 gallons of water. During the irrigation season 9.91 inches (0.83 acre-foot) of precipitation fell some of which was beneficial to rice and reduced the pumping requirements. The total amount of water received by rice, irrigation, and precipitation was 2.75 acre-feet per acre. This amount is based on the owner's estimate of 230 acres in the farm. The acreage will be measured and verified.

"The harvesting of the early variety of rice was in full swing and about one-half of the total rice crop has been harvested. The rice drying plants are operating at full capacity. The farmers and associations are having difficulty in shipping the rice to the mills as there is a shortage of railroad cars and there is an embargo on them. The storage at the mills is at full capacity, so they are using the cars for storage. The storage capacity at the driers is also limited and nearing full capacity. The rice production is large and good yields per acre are being obtained. The season has been very favorable for rice. One grower near Edna has sold his rice on the field (143 acres) for \$43,000.00. He still has about 335 acres left. He states his rice will gross about \$100,000.00 for the 478-acre farm. His production will run as high as 25 barrels (160 pounds per barrel) per acre, so the rice growers in general at the present time are making money and lots of it.

"All current silt determinations for August have been completed, data tabulated, and copies mailed to cooperators."

Irrigation Studies in California - Harry F. Blaney, Los Angeles, Calif.--Drainage Investigations, Imperial Valley.--Donnan reports-"The preliminary draft of the manuscript was completed for the Imperial Valley Drainage Manual. This manual details the step-by-step procedure for making a drainage investigation in Imperial Valley and sets forth rules for the design of drainage systems. The manual contains charts, graphs, and tabulations and is intended as a guide to drainage practices in Imperial Valley, Calif. Routine drainage and ground-water field studies were continued by George Bradshaw."

Aronovici, Pomona reports-"The section of the Imperial Valley Drainage Manual dealing with Quantity of Water to Be Drained, was completed. The technique suggested is based upon the principle that ' Q_d ' or the quantity of water to be drained in gallons/ square foot/day may be based on the relationship between the normal annual evapo-transpiration (40 in.) of alfalfa and the water applied. Previously, this estimate was based upon a valley-wide average of water applied. This procedure may best be expressed as follows:

$$Q_d = \frac{[W_a - (U + w)] \times 325,850}{(I \times C \times 43,560 \times 12)} = \text{quantity of water to be drained.}$$

or

$$Q_d = \frac{[W_a - (U + w)] \times 0.623}{(I \times C)}$$

Where W_a = Water applied in acre-inches per acre

U = Evapo-transpiration (consumptive use) in acre-inches per acre

w = Surface waste in acre-inches per acre

I = Number of irrigations per season

C = Irrigation intervals in days

Q_d = Quantity of water to be drained.

One acre-foot = 325,850 gallons

"This method has the advantage of taking into account varying field efficiencies due to specific irrigation lay-outs."

Irrigation Requirements - Blaney reports-"At the request of the Bureau of Reclamation an estimate was made of the monthly irrigation requirements and consumptive use for alfalfa in the Mojave Valley, Calif. The results are as follows:

Period ^{1/}	Victorville, Calif.		Period ^{1/}	Barstow, Calif.	
	Consumptive use ^{2/}	Irrigation requirement		Consumptive use ^{2/}	Irrigation requirement
	Inches	Inches		Inches	Inches
April 19-30	1.71	2.24	Mar. 10-31	2.81	3.30
May	5.28	7.40	April	4.65	6.39
June	5.75	8.20	May	5.69	7.99
July	6.49	9.16	June	6.44	9.06
August	6.08	8.41	July	7.11	9.89
September	4.89	6.61	August	6.60	9.06
October 1-14	1.65	2.13	September	5.31	7.31
			October	4.14	5.37
			Nov. 1-10	.97	1.26
	31.85	44.15			
				43.72	59.63

^{1/}Frost-free period. ^{2/}Consumptive-use factor for alfalfa 0.85

Water-Supply Forecasts - C. E. Houston, Reno, Nevada.-"Additional preliminary runoff data for Nevada obtained from USGS allow a comparison of forecast to runoff for the following streams:

Station	Forecast made April 1, for discharge April thru July		
	Forecast in percent of 1936-45 Ave.	Actual in percent of 1936-45 Ave.	Difference in percent
Owyhwe River at Mt. City, Nevada	40	49	9
Lamoille Crk. nr. Lamoille, Nev.	61	93	32
South Fork Humboldt River, nr. Elko, Nev.	40	50	10
Humboldt River at Palisade, Nev.	40	38	2
Martin Crk., nr. Paradise, Nevada	29	41	12
Carson River, at Ft. Churchill, Nev.	50	40	10
West Walker River nr. Coleville, Calif.	61	60	1
Maximum Storage in Lake Tahoe after April 1	640,000 acre-feet	602,000 acre-feet	5

"At the request of officials of Kennecott Copper Co. McGill, Nev., two snow courses were established on the headwaters of the water supply for the town of McGill and the company smelter. Water supplied through a 37-inch steel pipe line is extremely valuable and in some years runs short, necessitating importing late season supplies at considerable expense. The snow survey will advise the users when shortages may be expected, thus allowing conservation practices to be put into effect early, and the early importation of water prior to shortages. We have furnished snow-survey equipment and the company will furnish labor and stream-flow measurements.

Storage of Water Underground. (Water Spreading). - Dean C.

Muckel, Pomona, Calif., A. T. Mitchelson, Berkeley, Calif. - "In connection with studies being made on the degree of drying necessary to recover initial percolation rates on water spreading areas in San Joaquin Valley, an analysis was made of the soil-moisture data collected during the past 18 months to determine the rate of drying at different times of the year. Higher percolation rates have been obtained if the soil moisture is lowered to the wilting point during off periods of spreading. This cannot, however, be accomplished at all times of the year. Other conclusions reached are:

- (1) The field capacity of the top 6 inches of the Hesperia soil is between 15 and 18 percent and of the Exeter soil about 10 percent. Given ample time during the summer both soils dry to between one and two percent.
- (2) It does not appear that drying of the top 6 inches of soil much below field capacity can be expected during September through March on either soil. Some drying occurs, but the rains during 1946-47 were sufficient to maintain a moisture percentage near field capacity. Vegetation on the plots was not effective in substantially lowering the soil moisture during the winter.
- (3) Drying to the wilting point or lower was accomplished only during April, May, June, July, August, and September.
- (4) There was evidence that addition of cotton boll hulls increases the moisture-holding capacity of the soil and delays drying.

Irrigation Enterprise Study - Wells A. Hutchins, Berkeley, Calif. -

"The article entitled 'The Development of Irrigation in the Southwest' was prepared for the use of the 'California Cultivator' in its 70th Anniversary Number for October 1947.

"The publication 'Desirable Principles of State Water Legislation' is the report of the committee of the National Reclamation Association presented at the last annual convention at Omaha. This project was completed when the report was transmitted January 17, 1947, to Don McBride, Secretary-Manager of the National Reclamation Association, for publication. Mr. McBride writes that the report has been received, and that it is about to be mimeographed in his office, 500 copies being run off."

Flow of Water in Pipes - Fred C. Scobey, Berkeley, Calif.-"After some trials a design diagram for our new formula has been developed showing diameters D , quantity, Q , Velocity, V , and loss of head per 1,000 feet, H .

"Correspondence has been carried on with authorities of the several agencies connected with the construction of the San Diego aqueduct regarding arrangements for tests which they want and which will give the Division data on newest of concrete pipes of large size. Expense of the tests will be borne by the constructing agencies."

11/2/47

